WE CLAIM:

1. A method for the generation of three dimensional fractal subsurface structure by Voronoi tessellation and computation of gravity response of such fractal structure, by generation of fractal subsurface structures which are very close to the natural setting of the subsurface geology and provides computation of forward gravity response of such structures for delineation of the underlying anomalous object, said method comprising:
   (a) selecting Voronoi centers at a plurality of locations over a region of interest, the Voronoi centers being represented by X, Y, Z co-ordinates;
   (b) generating an initial model of the subsurface fractal geological object, having variation in physical property such as density in lateral and vertical directions; the initial model being generated by tessellating, the Voronoi centers, and assigning values of physical property variations during generation of the model on the basis of pre-determined assumptions in the model;
   (c) assigning different colours to regions in the model which have different physical properties such as density to enable demarcation.
2. A method as claimed in claim 1 wherein the fractal subsurface model is generated by modified Voronoi tessellation technique which comprises modifying the Voronoi tessellation by using L^p norm, where p is an exponent which can assume any real value, thereby enabling greater range for generation of different fractal sub-surfaces, which are very close to the real geological situations.
3. A method as claimed in claim 1 wherein the natural setting of the geological subsurface is selected from the group consisting of a sedimentary basin, hydrocarbon deposits, oil reservoirs, aquifers and mineral deposits.
4. A method as claimed in claim 1 wherein the computation of gravity response due to fractal subsurface generated by modified Voronoi tesselation is carried out by analytical expression which comprises:
   (a) demarcating boundaries of regions having different physical property, such as density in the tessellated region, the boundaries forming a polygonal shape in 2-dimensional space;

$$V = G\rho \sum_{i=1}^{n} [W\, arc\cos\{(x_i / r_i)(x_{i+1} / r_{i+1}) + (y_i / r_i)(y_{i+1} / r_{i+1})\}$$

$$- arc\sin \frac{zq_i S}{(p_i^{\,2} + z_i^{\,2})^{1/2}} + arc\sin \frac{zf_i S}{(p_i^{\,2} + z_i^{\,2})^{1/2}}]$$

Where S= +1 if p_i is positive, S= -1 if p_i is negative,

W= +1 if m_i is positive, W= -1 if m_i is negative,

'Z' is depth and 'n' is number of sides in the polygon.

G is universal gravitational constant, ρ is the density of the tessellated regions;

$$p_i = \frac{y_i - y_{i+1}}{r_{i,i+1}} x_i - \frac{x_i - x_{i+1}}{r_{i,i+1}} y_i,$$

$$q_i = \frac{x_i - x_{i+1}}{r_{i,i+1}} \frac{x_i}{r_i} + \frac{y_i - y_{i+1}}{r_{i,i+1}} \frac{y_i}{r_i},$$

$$f_i = \frac{x_i - x_{i+1}}{r_{i,i+1}} \frac{x_{i+1}}{r_{i+1}} + \frac{y_i - y_{i+1}}{r_{i,i+1}} \frac{y_{i+1}}{r_{i+1}},$$

$$m_i = \frac{x_{i+1}}{r_{i+1}} \frac{y_i}{r_i} - \frac{y_{i+1}}{r_{i+1}} \frac{x_i}{r_i},$$

$$r_i = +(x_i^2 + y_i^2)^{1/2},$$

$$r_{i+1} = +(x_{i+1}^2 + y_{i+1}^2)^{1/2},$$

$$r_{i,i+1} = +[(x_i - x_{i+1})^2 + (y_i - y_{i+1})^2]^{1/2}.$$

where the effect of common arm of the adjacent polygon is removed;

(b) repeating the gravity response computation due to the polygon for all adjacent polygons of different physical properties using the demarcated polygon boundary;

(c) adopting the process of gravity response computation for tessellated regions lying at different depths to obtain a response;

(d) integrating the response using Simpson/Gauss quadrature formula at plurality of grid nodes overlain on the region of interest.

5. A method as claimed in claim 1 wherein the results are achieved through self-written software, which generates Voronoi tessellated subsurface region and computes gravity response of the same.

6. A method as claimed in claim 1 being applied to geophysical inversion, wherein the tessellated regions are altered by changing the position of Voronoi centers in each iteration.